Table of Contents

Appendix J | Enterprise Architecture

Enterprise Architecture

Vision of Action

We are pleased to present the 2010-2014 Enterprise Architecture (EA) Plan to fellow citizens, State of Michigan employees and valued partners. Enterprise architecture at the State of Michigan has gone through many stages during the last 10 years. Through the early part of this decade, the Michigan Department of Information Technology (MDIT), formed through Executive Order, began a series of broad information and communication technology (ICT) consolidation projects.

Telecommunications and Network Services was one area to begin formal consolidation, bringing together agency ICT networks and building a Lansing-area local area network and an outstate wide area network. Agency telephone equipment and services were also consolidated. Other consolidations followed. These included:

- creation of the e-Michigan central Internet team and the Michigan.gov portal.

- consolidation of state e-mail architecture and services.

- consolidation of agency data center environments into the three DTMB-managed information technology hosting facilities.

- formation of a multiagency ICT Customer Support Center.

In 2006, soon after achieving the accomplishments listed above, the Department of Information Technology established the Office of Enterprise Architecture (OEA). OEA borrowed successful practices and models from other enterprise architecture programs and defined the State of Michigan enterprise architecture framework and supporting processes. Enterprise architecture acts as a strategic planner and architect for the state's ICT programs. Its role as a leader in formulating and advancing a vision for those programs is reflected in the following goals:

- Maximizing the state's return on ICT investments

- Providing sound advice based on objective facts and measurable outcomes

- Improving reliability, predictability and consistency of ICT solutions

- Reducing costs to implement and operate ICT systems

- Reviewing and consulting on designs and assessments

- Encouraging a technology model that leverages solutions for multiagency use

- Aggressively pursuing new and promising technologies to meet known business requirements

- Facilitating issues among other information technology groups to move difficult issues forward for the good of clients

- Aspiring to be a learning organization

- Clearly and consistently documenting solutions, pertinent research, findings, decisions, recommendations, standards and all other outputs for immediate and future guidance

In Michigan, we are called upon to be stewards of the public trust and tax dollars. We believe our investment in technology demands a rigorous and structured approach that will deliver the most benefit to citizens. The enterprise architecture process leverages our extensive planning in a way that aligns technical investments with public service needs.

Michigan's journey through enterprise architecture has taken many turns, encountered a few high hurdles and seen some remarkable successes. The pages that follow outline our vision, strategy and the tools we use to maximize our strengths and address our challenges.

A Look at the Great Lakes State

Michigan's agencies deliver essential services, making the state a better place for Michigan's 10 million citizens to live and do business. Michigan's Department of Technology, Management & Budget (DTMB) is responsible for more than 3,350 servers and 55,000 computers. With such a large operation, enterprise architecture—the planning and aligning of technology to support public service needs across all state departments—is a critical mapping and planning process used by DTMB.

Enterprise Architecture

Which state services does DTMB support? All of them. Whenever a citizen files income tax, pays or receives child support, wins the lottery, applies for a driver's license or starts a business, DTMB helps make it happen. As a comprehensive roadmap and framework for the state's technology, EA designates the on-ramp and off-ramp of technology as well as ICT standards and priorities to enable the state's business processes and achieve mission-specific objectives in a timely and cost-effective manner. With today's tight budgets, providing technology solutions that save time and money for government and citizens is a top priority. Disciplined innovation is a requirement. DTMB's Office of Enterprise Architecture maps out its technology innovation. In consultation with key stakeholders, OEA sets the direction of technology, driving ICT adoption and governance and enabling Michigan to move forward.

Benefits of EA

Alignment to the mission: Putting your money where your priorities are

By setting standards and direction, EA positions technology investments where they do the most good. EA maximizes technology, ensuring the state has necessary data and tools to deliver services in the most efficient way across all government service delivery systems.

Reduced costs: Giving back to the bottom line

The goal of Michigan's EA efforts is to reduce ongoing ICT costs through volume purchasing, fewer support staff and simpler upgrades. Faster implementation and a simplified easier-to-support environment result in better value and an improved bottom line.

Increased agility: Never having to say "We can't do that. Our system isn't built that way."

EA frameworks provide a ready reference when major changes are demanded on tight time frames. Mapping standards and services with applications allow developers to quickly assess impacts and respond to change. A comprehensive architecture also enables faster design of new systems and ensures a smooth, rapid response to business needs.

Improved security: Keeping hackers off your back

In IT, security issues are a fact of life. Each day, the State of Michigan blocks approximately 280,000 e-mail spam and virus attempts, 17,000 scans by hackers and nearly 14,000 potential Internet browser-based and Web-defacement attempts. Through the use of strong automated protection tools and mandated security standards, the risk of identity theft, intrusion, data loss and system downtime is dramatically reduced.

Reduced technical risk: Downtime is detrimental to our citizens

EA lends itself to a stable and standard technical environment. The ICT planning that happens through enterprise architecture decreases reliance on old, unsupported technology, allows current resources to support more and reduces the need for expensive specialty support staff. This translates to fewer systems outages and faster recovery times.

Improved interoperability and integration: Immediate, reliable information is key

Defining standards and specifications that enable state systems to talk to each other makes it easier to integrate multiple systems. EA allows the state to make accurate information available, decreases the cost of sharing information and ensures systems communicate correctly on the first try and over time.
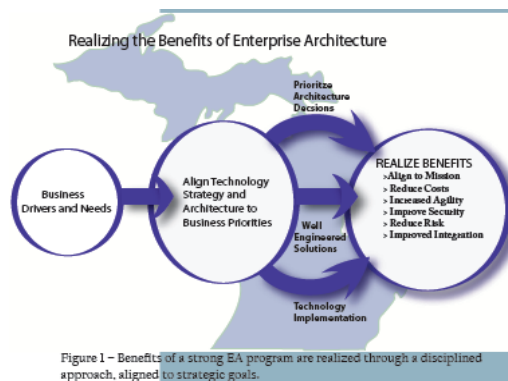

Figure 1 – Benefits of a strong EA program are realized through a disciplined approach, aligned to strategic goals.

Enterprise Architecture

Michigan's EA Framework

Michigan's enterprise architecture framework consists of four areas: public service architecture, information architecture, solution architecture and technical architecture. This section provides more details on each area.
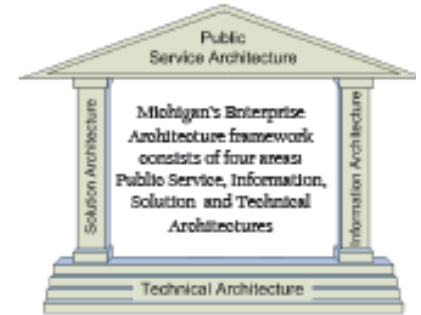
Public Service Architecture (PSA)

First and foremost, PSA focuses the state's limited technical resources where they matter most to clients: state agencies and citizens. We begin by obtaining a clear understanding of the goals, constraints and critical success factors. Then we define and document the processes most critical to state operations. With PSA, Michigan departed from traditional enterprise architecture bias and terminology. The unique nuances of public service and a need to clearly articulate priorities for technology staff demanded a different approach. Typically labeled business architecture in the private sector, public service architecture directs government in the handling of necessary services for citizens and sets the stage for the other three areas of Michigan's EA framework.

Information Architecture (IA)

Information is the key component of any system. For the State of Michigan, information architecture coordinates the use, reuse and sharing of state data. It models, classifies and leverages information needed to support key systems and enables cross-boundary initiatives with federal and local governments. IA focuses on identifying and standardizing innovative ways to use information.

Solution Architecture (SA)

Solution architecture is the framework and approach that governs how applications and systems are designed within the State of Michigan. SA ensures that technology aligns with goals outlined in the public service architecture and with data standards and structures from information architecture. SA streamlines the fulfillment of requirements and jump-starts the design process.

Technical Architecture (TA)

Standard tools are the hallmark of a strong enterprise. TA is the technological toolkit that serves as the foundation of all ICT initiatives. It outlines the lifecycle and appropriate use for all state hardware and software. This framework area provides proven models for efficiently implementing standards-based systems.

Interactions Among the Disciplines

The value of enterprise architecture is derived from the sum of its parts. As shown in the diagram below, the interactions within the EA framework create a complete picture of the processes that support sound technical decisions, an efficient organization and the creation of sustainable enterprise solutions.

Public service architecture captures changing agency needs, strategic goals and environmental influences and translates them into information technology priorities for the state. PSA defines what is most important and answers the question, "Why?"

Both information architecture and solution architecture use the priorities and processes generated from PSA to focus organizational resources where they will have the most impact. IA adapts information management standards to fulfill the state's requirements. Solution architecture creates a repository of high-level design solutions. Together, these framework areas answer the question, "What?"

Technical architecture is used in conjunction with the SA high-level designs to guide the assembly of technology components into complete solutions that can be leveraged to meet the needs of multiple agencies. TA combines outputs from the other areas to drive standardization of products and develop consistent implementation and operational policies. This answers the question, "How?"
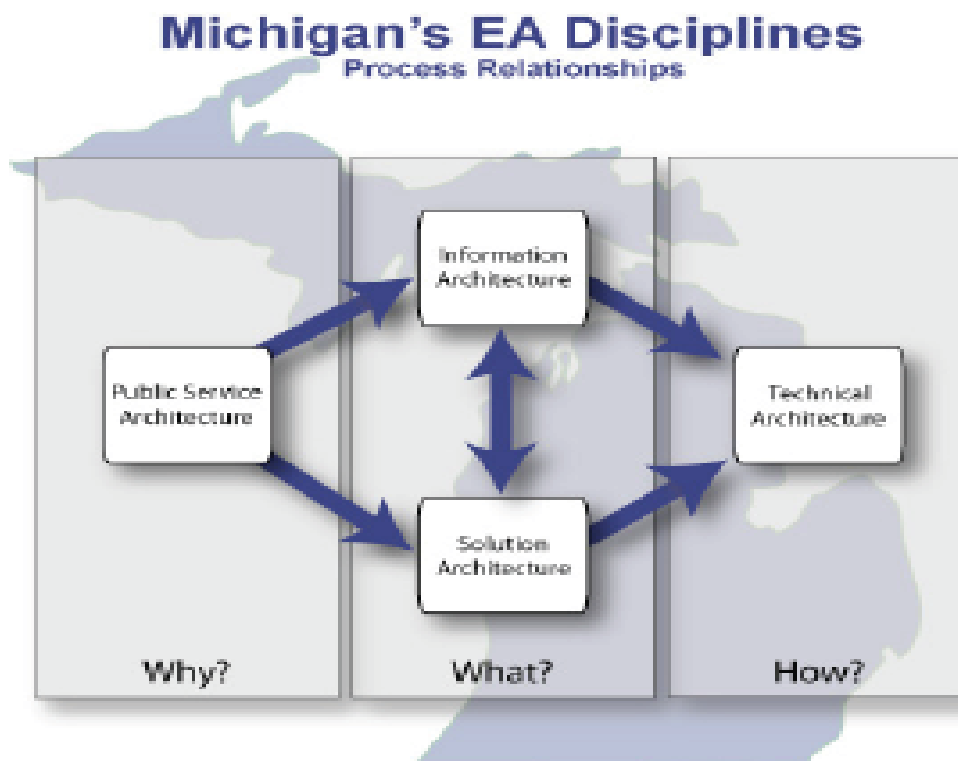

Figure 2 – The processes inherent in the four disciplines of EA interact in a continuous cycle. Initiatives may begin at any level.

Appendix J

Enterprise Architecture

Public Service Architecture

Public service architecture uses Michigan's core priorities to determine the focus of enterprise architecture. It captures the state's most important work activities, assets and processes. PSA focuses Michigan's limited technical resources where they matter most. To be truly effective, enterprise architecture must begin with a deep understanding of what drives the state. It is essential to align EA efforts with tangible business plans that have resources (money and people) assigned to them. Too many EA efforts fail because they lack detailed commitments, realistic scope and dedicated resources from the organizations the architecture serves.

Assessment and Progress

Michigan leverages the state's executive branch planning process—the Cabinet Action Plan (CAP)—to define and reinforce technology initiatives. The Office of Enterprise Architecture examines the CAP and the ICT strategic plan to determine the most beneficial enterprise architecture activities. This analysis results in a list of key drivers of Michigan's PSA and a specific work plan with detailed commitments.

Statewide Business Drivers

In 2003, Michigan's governor set six priority areas to drive business planning across all state departments. In 2010, work continues in these priority areas:

- **Creating Jobs Through Diversification**
  Governor Granholm's continuing effort to remake Michigan's economy

- **Creating a Well-Educated, Highly Trained Workforce**
  Doubling the number of college graduates and giving every person the tools for success in the 21st century economy

- **Protecting Michigan's Citizens and Their Pocketbooks**
  Safeguarding the physical and financial well-being of every Michigan resident, particularly our most vulnerable citizens

Agency-specific Business Drivers

Each agency also has business drivers used to develop technology plans specific to its needs. These include:

- creating an education lifecycle that presents a student's information as a common view.
- improving homeland security by integrating information and resources of all areas of Michigan's criminal justice community.
- protecting Michigan's citizens and communities by operating safe and secure prisons.
- improving state and local preparations to deter, prevent and respond to disasters or terrorism.
- continuing and improving the management of our state's natural resources.
- increasing access to state recreation areas such as parks, forests, campgrounds and marinas.
- protecting Michigan's citizens, retail markets and livestock.
- retaining and strengthening Michigan's manufacturing, agriculture and tourism base by creating new jobs.
- keeping Michigan's people and commerce moving by improving roads and bridges and increasing highway safety.
- expanding access to quality, affordable healthcare.

Outcomes and Targets

The following outcomes will be achieved through public service architecture. DTMB will develop an enterprise architecture work plan that aligns with Executive Branch and ICT

Public Service Architecture directs agencies and MDIT alike in the building of necessary services for our citizens and sets the stage for the other three areas of Michigan's framework.

ICT Strategic Plan
Appendix J- Enterprise Architecture

Strategic Plan priorities, detailing tasks and deliverables for the following activities:

- Service-oriented architecture (SOA) (ongoing)

- An enterprise strategy on identity and access management that delivers a rated and managed service (2012)

- Refreshed enterprise data warehouse architecture (2012)

- A comprehensive mobile application strategy (2010)

- A comprehensive plan focusing DTMB resources on prioritized EA initiatives and activities (ongoing)

- Michigan Unemployment Insurance Agency system rewrite (2011)

Information Architecture

Information architecture (IA) is the process of maturing and governing the information needed to support the business processes and functions for state and cross-boundary initiatives. IA spans organizational boundaries and builds on the requirements identified in the PSA. It is primarily expressed in the form of standards for the creation of data models, information flows and analysis of decision-making criteria for each business activity. IA also addresses information access, data security, privacy and business and information continuity.

Assessment and Progress

Michigan's IA has grown exponentially as a result of interagency collaboration on specific agency projects as well as related DTMB architecture and standards programs. The significant progress marks the quality and success of existing programs and establishes the baseline for developing the information architecture approach.

Data Sharing

Sharing data leverages federated, but definitive, information sources across areas to serve diverse public needs. This practice already exists among state agencies and federal and local units of government as well as vendor partners. Types of shared data include hunting licenses, unemployment data, driver's license information, personal protection orders, customs data, Medicaid information and immunization histories. These and many other data types are used to detect fraud, increase compliance and protect citizens.

Data Warehousing and Business Intelligence and Analytics

The practice of data warehousing and advanced business analytics are critical components of DTMB's decision support systems that allow the department to maximize shared data. To date, 2.3 terabytes of data are consolidated into our statewide warehouse. Analytics tools have helped:

- locate 15,000 noncustodial parents, enabling enforcement action and child support collection.

- save $75 to $100 million via statewide healthcare analysis with the Department of Community Health.

- decrease fraud and error rates in day care, food assistance and eligibility, saving more than $61 million.

- increase productivity by enabling the annual review of more than 452,000 tax returns by the Department of Treasury's tax audit and compliance staff.

Enterprise Architecture

Cross-Boundary Information Sharing

Michigan's cross-boundary information-sharing initiatives are expanding the use and communication of information across state agencies and beyond state government. Activity is underway in areas such as health information networking, permit application processing, geographic information sharing and land use management.

The state's EA program is developing standards for sharing the massive amounts of information available from federal, state, local and private entities to improve decision-making and add citizen value. Examples of cross-boundary information sharing underway include:

- sharing location data via spatial Web services.
- standardizing electronic payments to the state with the Centralized Electronic Payment and Authorization System initiative.
- creating a Michigan Information Operations Center, also known as a fusion center, to expand information and intelligence sharing between homeland security partners.

Business and Information Continuity

A complete review of business and information continuity plans is in progress at the State of Michigan. Continuity requirements are being refreshed for the business functions supported by the most critical state systems in consultation with clients. Simultaneously, an ICT business and information continuity core team is documenting existing disaster recovery and continuity capabilities and capacities available within the ICT organization to support those business functions. Once these reviews are completed, projects will be initiated to close any exposed gaps.

Outcomes and Targets

Michigan's information architecture defines the information management needs and goals identified through the public service architecture process, including:

- establishing a state agency privacy council with privacy officers in place supporting state executive branch agencies (2010).
- completing classification of data for each state agency (2012).
- defining owners for all information entities (2013).
- establishing a common way to describe a citizen and the way the term is used in information systems (2012).
- providing common data standards for all agencies and other government entity information (2013).
- reducing data management centers to three (2010).
- personalizing views of content and applications for citizens, businesses and state employees (2010).
- implementing a consistent data exchange approach (2011).
- defining data point-of-recovery objectives for critical business information (2011).

Solution Architecture

Solution architecture (SA) defines the standards that allow DTMB to assemble technical components into solutions by quickly identifying proven, standard and secure solution designs that can be leveraged to meet business needs. Solution architecture is expressed in terms of the solution patterns governing application design and evolution. Value can be measured in terms of reliability, scalability, performance, security and decreased support and maintenance costs.

Enterprise Architecture

Michigan's approach to EA intentionally separates solution architecture from information and technical architecture. The key differences among the three disciplines involve the deliverables and outcomes, as described in the sections that follow.

SA Assessment and Progress

While the bulk of infrastructure and many key enterprise systems are leveraged across the state, Michigan is still in the early stages of assembling a strong portfolio of standard solutions. Although progress has been made with a number of key systems (financial and accounting systems, a single statewide portal, messaging consolidation, a thin-client center of excellence, etc.), most software development is still done within teams dedicated to a single department. A common solutions engineering methodology is used to standardize technical reviews (solutions assessments) and requires all new development to leverage solution architecture.

Solution Patterns

Solution patterns serve as the high level of system design templates. Patterns document the logical layout and form of a technology solution. Solution patterns do not specify particular technology products but focus on the interactions of components. For example, when building an Internet Web application, the solution pattern will identify the type of servers needed (application server, Web server, database server) and the type of protective measures to ensure security (firewalls, security appliances, etc.).

Development of a pattern is done through an iterative process. Using the concepts highlighted in the EA framework, the Office of Enterprise Architecture commissioned a team to develop a base set of solution patterns. Working with a small work group of DTMB solution development and support team members, the EA core team identified highly mature, broadly utilized and stable solutions. These solutions served as the basis for the initial solution patterns and reference models.

Once a solution pattern is completed, technical architecture processes are used to develop reference models and standards. Each solution pattern has multiple reference models and standards.

Reference models and standards give DTMB technical teams a complete reference of recommended products, best practices, designs, integration considerations and use standards for every solution pattern completed.

To date, solution patterns have focused heavily on Web-enabled applications, but as we gather information through our EA solutions review process, we will establish a repository of core solution patterns and reference models that provides a preferred architecture approach for the majority of technology projects.

Outcomes and Targets

Following are the State of Michigan solution architecture effort targets:

- Solution patterns will be established for the following areas (2010):
  - Statewide collaboration architecture
  - Service-oriented architecture
  - Identity and access management
  - Comprehensive mobile application strategy
- Solution patterns will be established for the following areas (2012):
  - Data warehousing and business intelligence
  - Cloud storage alternatives for technology solutions, including internal self-service on-demand storage and external Internet-based cloud storage.
- The EA solution review process will be used to review 100 percent of new technology projects (2010).
- The formal solutions review process will be used to assess 90 percent of existing systems (2012).

Enterprise Architecture

Technical Architecture

Making sound technology decisions and setting clear direction for the enterprise is one of the most visible EA activities. Maintaining a plethora of disparate products raises costs and reduces DTMB's ability to support the enterprise. Technical architecture elements are coupled with solution patterns from solution architecture to form a detailed picture of technology. TA is the foundation of the EA framework. It is the process that selects standard products, mandates best practices for their implementation, and manages each product's lifecycle throughout the enterprise. Decision making in technical architecture is guided by the following guideposts developed within the EA framework areas:

- Best Practices and Usage Standards: Information captured from institutional knowledge as well as research vendors and partnerships

- Policies, Standards and Procedures: Developed within the TA as well as by administrative or legislative policy directive

- Current Architecture Solution Patterns and Reference Models: Detailed descriptions of existing and implementations of standard solutions patterns

- EA Portfolio Assessment Tool: Although used in all four framework areas, portfolio assessment is especially useful in TA. Objective data is plotted, which jump-starts discussion and analysis,

Technology decisions also are informed by vendor partners. To this end, DTMB has created multiple venues for input. In addition to the traditional request for proposal route, vendors may introduce their product to the State of Michigan via the Horizon and Spotlight programs. Horizon provides access to executive leadership monthly. Suppliers whose products match state priorities may provide brief presentations to the leadership team. Through Spotlight, suppliers may provide in-depth demonstrations to executives and subject-matter experts. These forums are productive, not only for the vendors interested in doing business with the state but for DTMB, which is interested in keeping up with market trends and offerings.

TA Assessment and Progress - Setting Product Standards

Setting standards is not a trivial task. The Office of Enterprise Architecture must consistently weigh the unique government requirements for open competition with the realities of staff skill sets, cost and the pressure to lower state expenditures. Direct involvement from state agencies is facilitated through DTMB's executive steering committee, the Michigan Information Technology Executive Council (MITEC).

The entire process is designed to be inclusive and iterative, balancing ongoing support requirements with the rapid pace of technology innovation. The technical architecture areas are driven by the needs highlighted in the other framework areas as well as the need to address the emerging technologies the state will likely adopt.

Product standards developed in the TA include guidelines for installation, configuration (specific versions) and parameters. This detailed information augments and drives the reference models—describing how specific products can be combined to deliver a solution—from the solutions architecture. The formal process for developing product standards is detailed on pages 27-29. Some key standards developed this year include:

- Statewide office automation (directory services, desktop management, desktop OS, file share, etc.)

- Hosting centers (facilities, installation and configuration of equipment)

- Voice over Internet protocol (VoIP)

- Wireless LAN and communication

- Open-source products

TA Assessment and Progress - Mapping a Product's Lifecycle

By analyzing industry trends and defining best practices around the use of technology, technical architecture maintains and develops technology lifecycle roadmaps. These roadmaps drive adoption and regulation of ICT. Information on technical products is gathered from supporting vendors, and strategies for use within the state are planned on a four-year schedule. The roadmaps classify each technology by explicit version or release. EA, working with technology subject matter experts (specialists), manages the identification, classification and strategic direction of the use of specific technology at the state. EA conducts semi-annual updates to technology lifecycle roadmaps based on industry changes and technology adoption and implementation.

Objectives and Targets

Following are Michigan's technical architecture objectives and targets:

- Continue to remove redundant or outdated technologies from the technical environment (ongoing)

- Achieve double the average CPU utilizations for managed servers through virtualization (2010)

- Enhance processes to drive planning and budgeting for technology governance (2011)

- Administer and manage 80 percent of all solutions according to approved operational policies and standards (2011)

- Achieve zero annual growth in total physical number of servers under management through virtualization (2011)

- More than half of solutions rely on unsupported products; migrate versions to approved, standard platforms (2011)

- Design and implement 90 percent of solutions according to approved reference models (2012)

Implementing Michigan's EA Framework

The concepts of Michigan's EA framework are more than academic theory. When coupled with a comprehensive planning process, they coordinate and drive technology activity for the state.

The following section outlines the structure and methods used to turn the framework into actionable initiatives. A work plan and resource commitments ensure progress. Critical processes and tools ensure EA is a sustainable effort that will transform our state through technology. Each element is discussed below.

The EA Work Plan

The four disciplines allow enterprise architecture to plan and realize the vision for Michigan's technology future. This work plan is derived from the planning efforts in the PSA, which represent a portfolio of initiatives grounded in true business priorities.

The work plan is approved by DTMB executive management and a client-based steering committee (MITEC). Progress is monitored every week for deliverables and issue resolution.

The Office of Enterprise Architecture's multiyear plan extends beyond the current fiscal year. The plan is updated as needed to reflect changing businesses needs, budgetary fluctuations and the rapid pace of technology innovation. DTMB's EA work plan for 2010-2014 is presented on the pages that follow.

Enterprise Architecture

Resource Commitments and Governance

Team Charter

The EA Core Team is at the center of EA activity. The Office of Enterprise Architecture facilitates this cross-departmental team of DTMB technical leaders and specialists. It includes staff appointed from all areas of the DTMB organization: Contracts and Procurement, Enterprise Security, Office Automation Services, Telecommunications, Data Center Services and each software development group serving state agencies.

The Enterprise Architecture Core Team oversees the assessment, adoption and use of technology for the State of Michigan. Members establish and utilize processes and procedures to assess technology needs across the four EA framework areas. The architects in the EA core team have several roles. They:

- oversee and advise DTMB architecture workgroups and standards development teams.
- work with the DTMB Contract Office to establish the criteria for technology bids.
- develop processes for information dissemination and communication.
- maintain and oversee the processes to select, review, evaluate, approve or deny and prioritize enterprise architecture to include ICT standards, policies, strategies, architectures and guidelines.
- conduct technical process engineering.
- perform EA portfolio analysis.
- oversee technology exception reviews.
- review and evaluate vendor proposals.

Authority

Decisions of the EA core team are binding for the DTMB organization but are subject to review and approval by DTMB executive management. Appeals for the EA core team's technical decisions are sent to the Executive Technology Review Board, which includes:

- Deputy Director of Infrastructure Services, DTMB
- Information Officer (appointed by Agency Services Deputy Director, DTMB)
- Chief Information Security Officer
- Director, Telecommunications, DTMB
- Director of Office Automation, DTMB

The EA core team is empowered to appoint persons for architecture workgroups to do technology assessments and adoption planning, standards development teams, vendor briefings and establish processes, as necessary, to enable the core team to carry out its responsibilities.

Figure 1 – The EA core team is a combination of roles that pull together the technology leadership across the MDIT organization.

Portfolio Assessment

Making EA decisions and prioritizing the EA agenda is a constant challenge. Michigan's EA framework is designed to be pragmatic and flexible, allocating resources where they do the most good. This more flexible approach means that even with the high-level priorities defined in the public service architecture, EA must have the ability to quickly assess the portfolio of initiatives, projects and tools in each of the four areas of the EA framework.

Every day the Office of Enterprise Architecture faces difficult technical and project priority decisions that have a broad impact on the state.

The EA portfolio assessment model is the premier tool used to assess activities in any of four EA areas. Whether evaluating a new public service offering, an exciting data collaboration project or evaluating the state's desktop tools, this model takes a hard look at objective factors and jump-starts the decision-making process.

This simple model assesses any activity in the EA portfolio across two dimensions:

- The first dimension quantifies the utility's initiative or technology by determining its level of adoption across state agencies, overall visibility and intrinsic business value.

- The second dimension is its level of maturity, which is measured using a solution for compliance with defined standards, the ability to maintain it, its scalability and whether its implementation follows best practices.

Quadrant 1 – Underutilized Solutions

Solutions that cluster near quadrant 1 are highly mature with relatively low utility across the enterprise. This practice, technology or activity is a great target for aggregation and consistent, coordinated management. These types of initiatives or products represent areas where cross-boundary implementations and cost savings can likely be achieved by establishing a "center of excellence" that leverages resources in the most efficient manner possible.
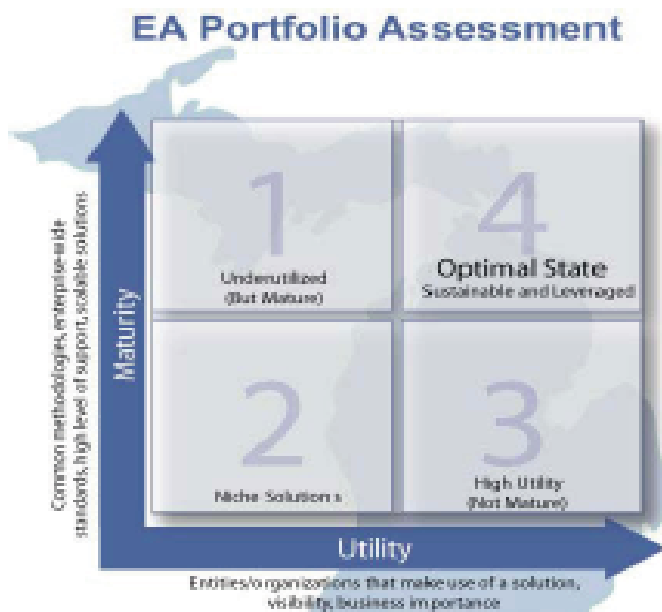

Figure 4 – The EA Portfolio Assesment Model: Each EA initiative under consideration or technology decision is evaluated on two key dimensions.

Enterprise Architecture

Portfolio Assessment (Cont.)

Quadrant 2 – Niche Solutions

Solutions and activities that cluster near quadrant 2 do not demonstrate a high degree of maturity, although they are likely mature enough to be considered sustain¬able given their limited installation and use. Unless overall business requirements change to raise their importance to the enterprise, these solutions typically do not merit resource investment as the statewide impact of EA investments would be minimal.

Quadrant 3 – High Utility Solutions Lacking Maturity

Solutions that cluster near quadrant 3 have high utility but low maturity. These activities most likely surround critical legacy systems developed and implemented before Michigan's IT consolidation. Examples include disparate call centers, ERP systems and permitting systems, to name a few. When critical functions are implemented with a wide variance of technical solutions, the enterprise can be exposed to significant risks, unsustainable levels of staff commitment and unnecessary financial exposure. When these systems are at the point of investment (typically a rewrite or major upgrade), EA works to justify the investment in standardization, process improvement and stabilization to move the entire enterprise to a single solution.

Quadrant 4 - Optimal State (Enterprise Solutions)

Solutions that cluster near quadrant 4 should be held up as examples to the enterprise. Where possible, enterprise architecture drives adoption of the standards and methodologies employed by their design, development and support teams across the entire ICT organization. This dissemination of best practices encourages collaboration among technical teams and is an important area of focus for the Office of Enterprise Architecture.

Moving to Optimal

In the world of technology, optimal is golden—optimal usage, optimal performance, optimal cost effectiveness. It is therefore the goal of any EA activity to move Michigan toward optimal ICT performance, as reflected in figure 5. Each activity, initiative or technical solution falls into a particular realm of ICT evolution or quadrant, depending on the present state of that activity. Different strategies are necessary to reach the optimal (quadrant 4).
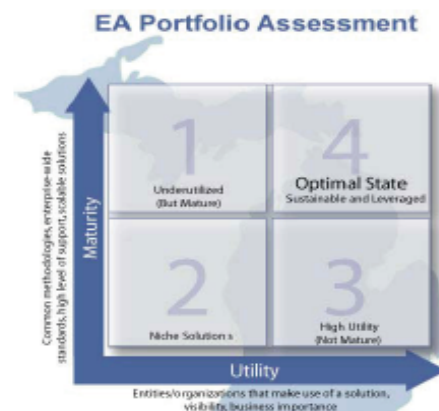

Figure 4 – The EA Portfolio Assessment Model: Each EA initiative under consideration or technology decision is evaluated on two key dimensions.

Moving to Optimal (Cont.)

Solutions that fall into quadrant 1 are recognized as mature within the state but underutilized. EA works with the primary owners of these solutions, determining how to make them broadly available for use, thereby avoiding the costly and unsupportable problem of creating multiple solutions for the same business problem. In other words, EA provides a means for enterprise-wide solutions so we avoid recreating the wheel from agency to agency.

The primary EA activity for quadrant 1 solutions is determining ways to leverage existing, robust and supportable platforms across the state. Enterprise-wide centers of excellence are one approach in active use. An example of EA at its finest is the approach taken for the Citrix Meta Frame architecture. DTMB established an enterprise-wide center of excellence based on the work done to provide a robust and stable implementation of Citrix for one state agency. Projects with a similar demand for a Citrix solution are directed to the center of excellence, utilizing the skills and experience of the supporting staff for this mature approach for implementing Citrix.

Quadrant 2 activities are unlikely to warrant additional allocations of limited resources. Activities in this quadrant merit investment in improving their maturity only if utilization is expected to increase enough to represent a substantial improvement in business value.

Solutions that fall into quadrant 3 are recognized as opportunities for standardization and migration to better-supported technologies. Solutions in this quadrant are heavily used but may represent aging technologies, one-off solutions or systems that are brittle and difficult to support.

Such a scenario is identity and access management (IDM), wherein several applications throughout the state have nonstandard approaches for identity management. This includes custom-made solutions for storing usernames and passwords, custom extensions of commercial products and nonstandard deployments of technology product stacks. At the time these applications were developed, there were no broad standards for IDM or application delivery. Recently, the EA team spearheaded a request for proposal for an enterprise identity and access management system, including an application portal for the proposed solution. By developing a common approach to IDM, the EA team will provide a means for resolution that affords improved standardization and supportability. The IDM solution and the accompanying portal are clear examples of moving solutions from quadrant 3 toward quadrant 4.

EA has prioritized evaluation of heavily used technology solutions to develop and implement standard architectures. The EA standards development process, detailed in the next section of this document, is being followed to mature and manage a standard set of technologies. Architecture reference models with product stacks reinforce the proper use of the standard set of technologies. EA solution assessments are the means through which project teams are directed to use standard technologies and reference models.

Standards Development Process

DTMB's Office of Enterprise Architecture drives the process of technology adoption and governance. One of enterprise architecture's roles is to deliver direction and guide decisions on the evaluation, adoption and implementation of technologies across state government. An active role in selection and adoption of new technology is important, but guiding the planning and migration from aged and expired technology is also critical to serving the business needs of our client agencies. Through this process, we've adopted the phrase "controlled innovation."

Working hand-in-hand with our Agency Services teams, EA governs the method of introducing technology, assessing total cost of ownership, mitigating risk and moderating the pace of change. A careful balance is needed here: unchecked acceptance of technologies results in too many solutions, a diluted ICT talent pool and a challenge in the ability to leverage solutions across agencies and the enterprise. Lock-down restriction or limiting technology adoption limits the services and benefits we can deliver to our citizens. Controlled innovation allows us to balance advancements in the technology industry with an organized, business-oriented technology planning and governance effort.

To keep abreast of new technologies and their potential use and benefit to the state, DTMB has formal programs and methods to review new technology solutions. Critical input and research is

Enterprise Architecture

also provided by industry analyst organizations, including Gartner, Forrester and Norex. Finally, our decisions are also guided by best practices from state and national technology communities such as the National Association of State Chief Information Officers (NASCIO). Vendors also have an opportunity to submit their technology solutions through the procurement process in response to a state request for information or request for proposal. Still other technologies enter into use through state and federal policies and programs.

To organize and plan for all of the upcoming and outgoing technology solutions, the State of Michigan utilizes technology lifecycle roadmaps.

A Focus on Standards

Standards and their enforcement are the backbone of Michigan's approach to meeting many of its strategic goals and objectives. As such, this process plays a major role in the state's technical architecture. Standards are defined and documented at several levels throughout the Enterprise Architecture process. There are two chief types of standards within this process:

Standard Solution Patterns

Standard solution patterns are concerned with the overall requirements of a given technology domain or process. These standards define what a technology should accomplish, its integration requirements, environmental limitations and business issues it must resolve.

Reference Models and Product Standards

Reference models and product standards deal with specific technology product selections. Including preferred version numbers, engineering and configuration specifications and support model definitions. The standards process was created to maintain consistency from the initial recognition of a business need to the ultimate selection of technical solution and vendor. For this reason, DTMB's standards development model overlaps areas within Enterprise Architecture and acts as a consistent oversight check and balance to ensure products meet needs.

Once a business need is recognized, the standards development team prepares the relevant solution pattern. This process consists of requirements gathering sessions involving a cross-functional team of staff from client departments, interested parties and the Office of Enterprise Architecture staff. Once the appropriate solution pattern has been built, the team analyzes whether a reference model can be built from existing product standards. If not, then research and proof of concepts are performed with careful effort to keep the research and development focused on the key criteria of a successful technical solution.

During the proof of concept (POC), the solution pattern and potential reference models are reviewed and questioned for their return on investment potential, viability given the capabilities of alternative solutions and migration challenges faced by particular departments. Additional industry information and analysis are also utilized in the POC/pilot to support the team assessment and planning efforts. The information gathered is used during a product selection and procurement phase. Once the solution is available to the state, a formal pilot of the technology is conducted. This pilot identifies the optimal configuration, engineering issues and support models of the technology, in addition to any other associated best practices.

These items are documented and become part of the product standard for that given technology and its use. In many situations, as described above, DTMB teams make decisions on the introduction of new technologies and the retention or replacement of existing technology solutions. The entire process is iterative and responsive to the changing technical environment.
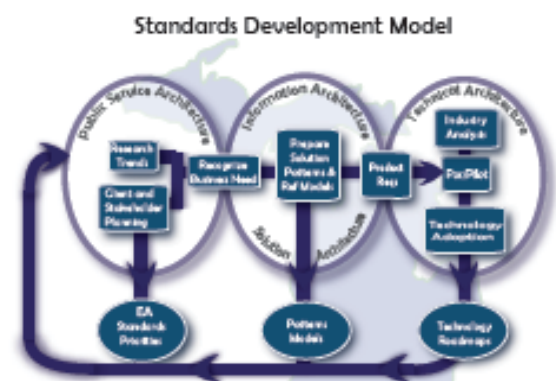

Figure 6 – Enterprise Architecture is fully integrated with the State's common engineering philosophy. It offers many benefits from a quality assurance perspective as well as a qualitative perspective.